VALLORII

Asset health and resilience

Roundtable, 26th November 2025

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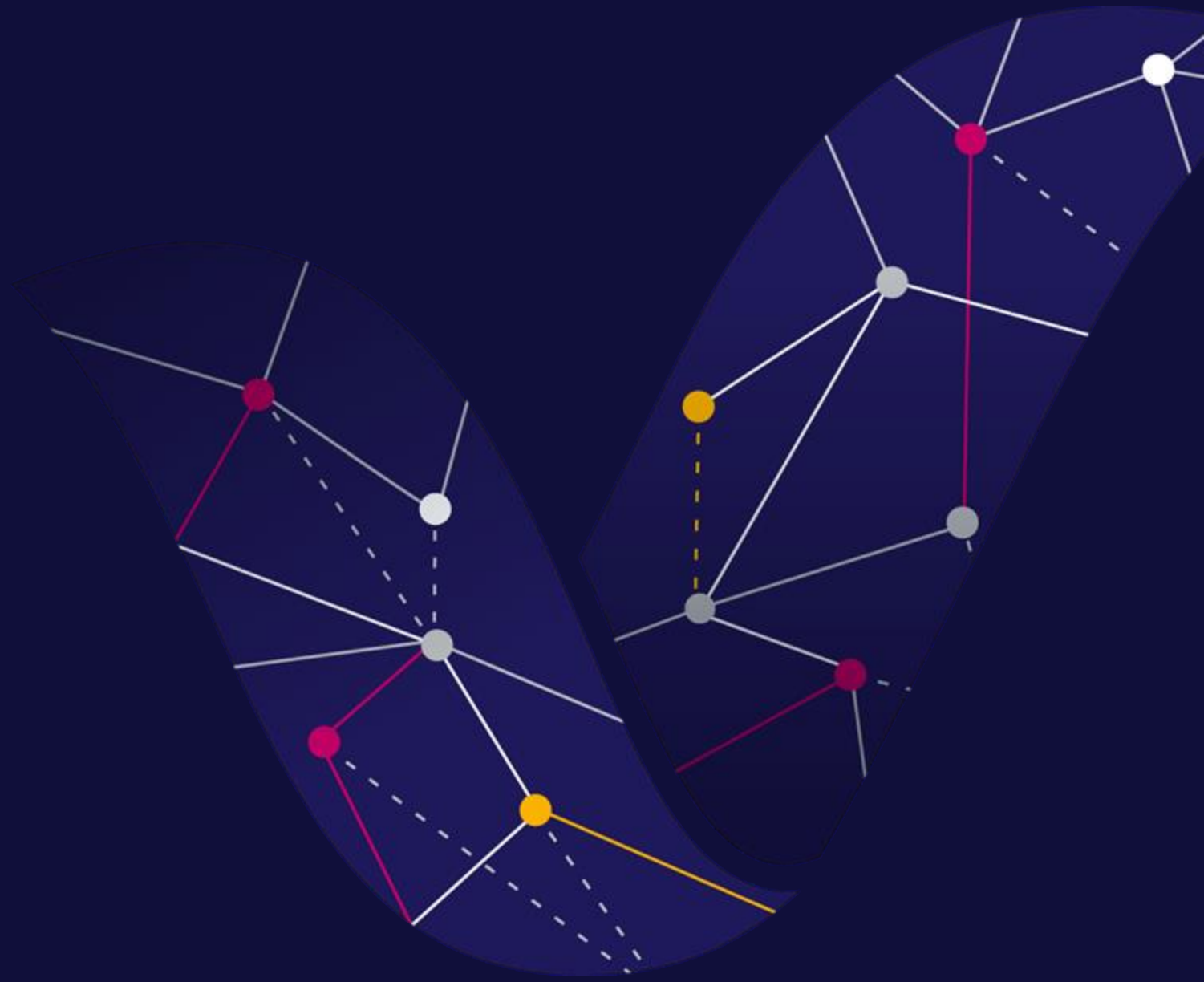


VAPRI – The Vallorii Price of Risk Model
Today: Asset health in infrastructure

July 2025

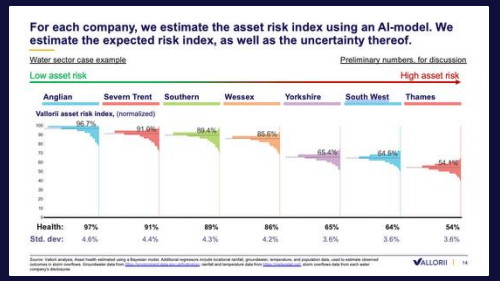
Introduction of VAPRI

- Construction risks in greenfield CapEx
- Counterparty risks
- ***Case study***: CoE for new water sector major projects

September 2025

- Macroeconomic risks, especially UK bond market
- Balance sheet details for brownfield assets
- ***Case study****:* London Heathrow

November 2025



- Vallorii asset resilience index (VARI)
- Valuation and CoE implications of asset risks

Key themes for 2026 roundtables (preliminary):

- Affordability
- Depreciation
- Financial resilience
- Geopolitics
- Liquidity
- Stock markets

Today: We discuss asset health and resilience in brownfield infrastructure

Risks analysed in 2025

- Bond market risks
- Illiquidity risks
- Counterparty & Financial default risks
- Infrastructure demand risks
- System risks
- Construction risks
- Political / regulatory risks
- Asset health risks

Risks to be considered in 2026

- Exchange rate risks
- …

Asset resilience is under scrutiny. Performance penalties are piling up in the water sector. Electricity networks are under the microscope after the LHR outage. Gas networks need to replace aging assets amidst depreciation discussions.

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VAPRI provides a new lens on cost of equity across infrastructure assets

Cost of Capital Lab 

Company database 

New beta version available to Founding Members

IRR database 

Under development

Sector	Asset	CAPM, real	**Risk-based CoE** VAPRI, real (*prelim.*)	**Allowed RoE** VAPRI, real (*prelim.*)
Electricity Generation	Offshore wind (2025 AR7 CfD)	**~14%** (DESNZ)	**9.7 – 10.6%**	N/A
	Hinkley Point C (2015 CfD)	**5.7 – 7.3%**	**13.5 – 15.5%**	N/A
	Sizewell C (RAB)		**10.0 – 12.0%**	N/A
Electricity Transmission	National Grid	**5.64%** (Ofgem T3 DD)	**5.6 – 7.8%**	
	SSE		**7.8 – 8.7%**	
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Gas Transmission & Distribution	National Gas	**6.04%** (Ofgem T3 DD)	**5.4 – 5.9%**	**Notional company perspective under development**
	Cadent Gas		**6.3 – 7.4%**	
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Telecoms	5G Auctions	**5.5 – 7.9%**	**10.4 – 13.1%**	N/A
Water (Sewage)	Beckton Water Recycling DPC	**6.3%**	**9.2 – 9.6%**	N/A
	HARP & Cheddar II DPC		**7.7 – 8.5%**	
Water (combined) *Case study today*	Anglian	**5.9%** (CMA prov. Appeals decision)	**6.7 – 7.5%**	
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	Thames		**10.3 – 11.9%** ← Excluding short-term default risk	
	Wessex		**7.1 – 7.5%**	
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Airports	London Heathrow (excl. 3rd runway)	**8.87%** (LHR BP)	**7.0 – 8.5%**	
	London Gatwick (excl. 2nd runway)	**8.6%** (CoC Lab)	**7.4 – 8.9%**	
	Manchester		**7.5 – 9.0%**	N/A

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Vallorii Price of Risk Model (VAPRI): AI-enabled, forward-looking return & valuation analysis
Vallorii Asset Resilience Index (VARI): AI-enabled resilience analysis based on asset performance

1 AI

How can we use AI to measure asset resilience?

- UK assets lag European comparators in key performance indicators for wastewater, electricity and rail
- New Vallorii AI-based Asset Resilience Index (VARI) for infrastructure using performance and environmental data
- ***Case study***: VARI scores across UK wastewater–Anglian and Severn Trent lead the index, Southern shows high resilience despite ODI penalties, Thames, South West, Yorkshire are lagging

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How does asset resilience impact infrastructure valuation and cost of equity?

- Asset resilience directly impacts valuations and the cost of equity
- ***Case study***: VAPRI estimates equity valuation impacts ranging from 15% premium (Anglian) to 53% discount (Thames), based on VARI scores and the CMA's October 2025 5.9% real CoE target

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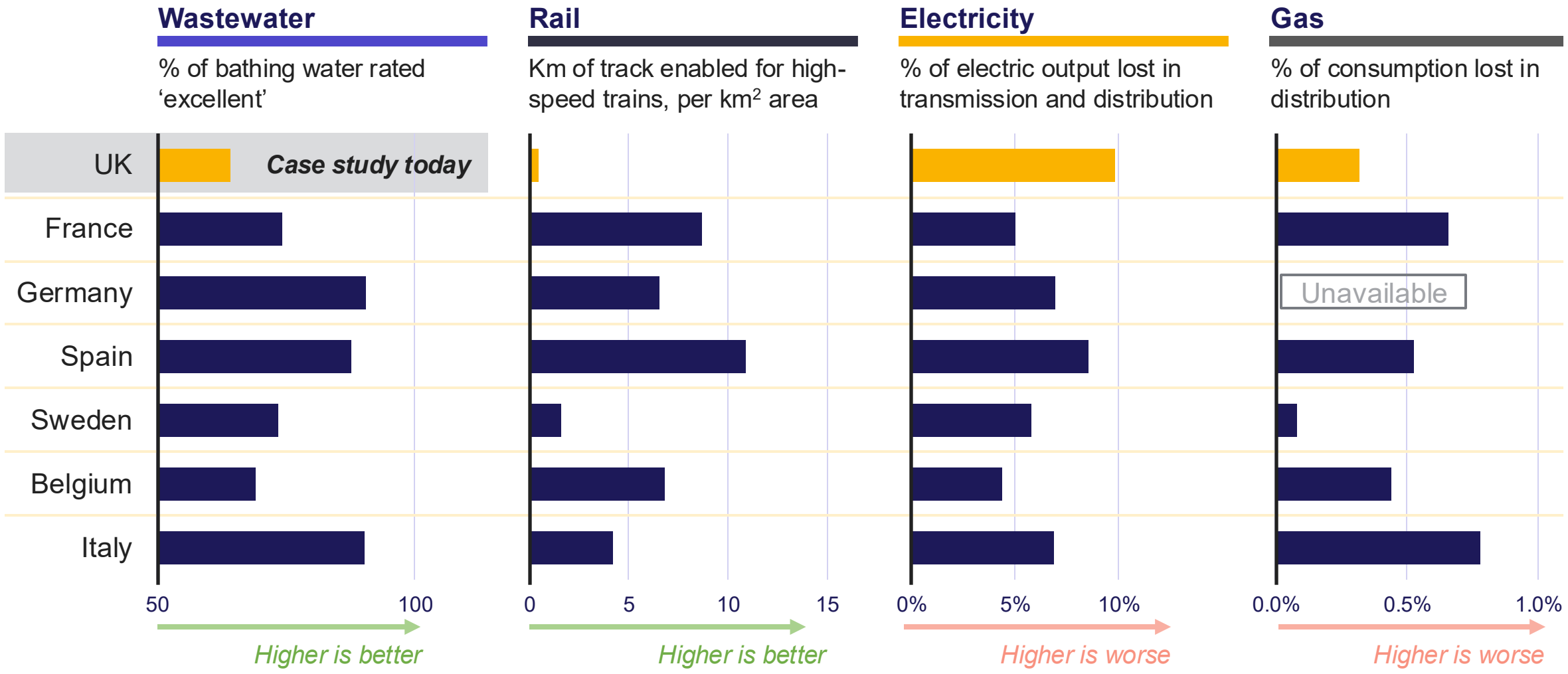
How to increase consumer trust and fund asset resilience improvements?

- Monitoring and asset health metrics (e.g., Ofgem NARM) can improve trust with transparency
- Could the supervisory model (Cunliffe report) drive long-term improvements in the water sector?

Asset performance varies by country and sector. UK is lagging Europe, particularly in Electricity, Wastewater and Rail.

Preliminary numbers, for discussion

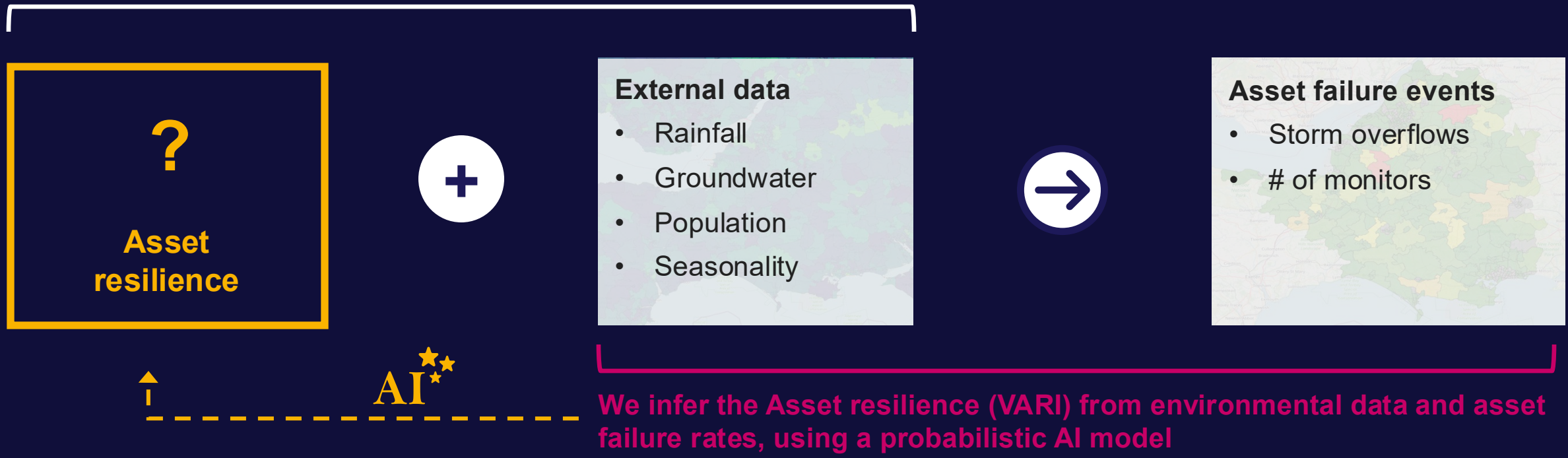


Source: Water: Environment Agency, European Environment Agency (2024), Rail: UIC (2025), Electricity: IEA Energy Statistics Data Browser (2023), Gas: Eurostat, Dukes, NGT UAGCVS Report (2024, 25)

Vallorii AI-based Asset Resilience Index (VARI) quantifies the sensitivity of asset performance to environmental data.

Wastewater case example

If asset resilience is **high**, assets are insensitive to environmental events. If asset resilience is **low**, asset performance is highly sensitive to the environment.



Assets react to environmental events. Resilient assets are less sensitive to their environment; risky assets are highly sensitive.

Wastewater case example

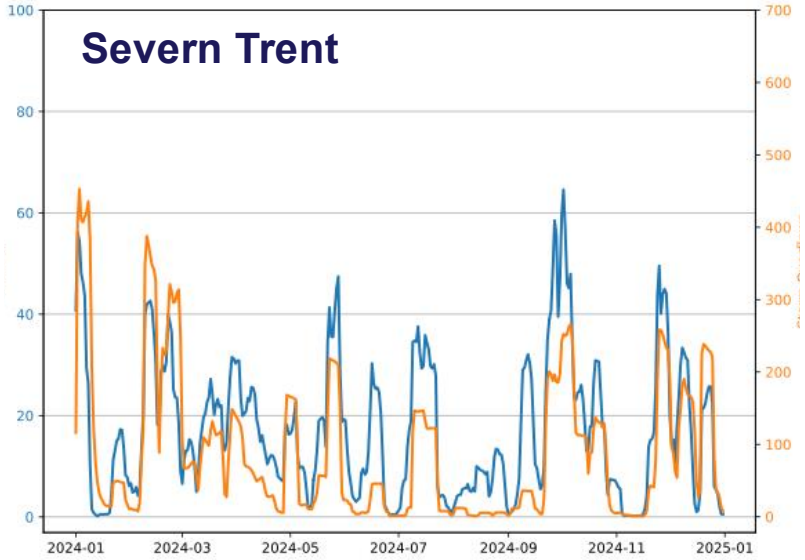
Preliminary numbers, for discussion

High asset resilience

Low asset resilience

Weekly rainfall (mm)

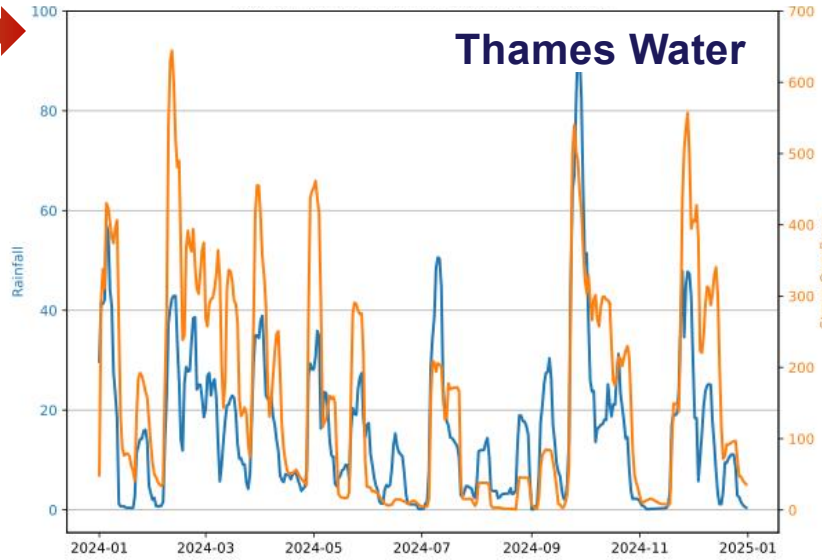
Storm overflows per monitor (average duration, hrs)



TW is more sensitive to rainfall that SVT.

Weekly rainfall (mm)

Storm overflows per monitor (average duration, hrs)



+ additional factors (groundwater, population, seasonality)

+ additional performance metrics (# of monitors)

Resilience may depend on:

- Asset quality & technology
- Asset capacities with respect to their environment
- Climate change
- Operational efficiency
- Network complexity
- …

Source: Vallorii analysis, Asset resilience estimated using a Bayesian model. Regressors include locational rainfall, groundwater, temperature, and population data, used to estimate observed outcomes in storm overflows. Groundwater data from https://environment.data.gov.uk/hydrology, rainfall and temperature data from https://meteostat.net/, storm overflows data from each water company's disclosures in 2024. Storm overflow location coordinates gathered from Stream UK

We estimate VARI across the wastewater sector. Anglian, Severn Trent, Southern, and Wessex show highest resiliency indices.

Wastewater case example

Preliminary numbers, for discussion

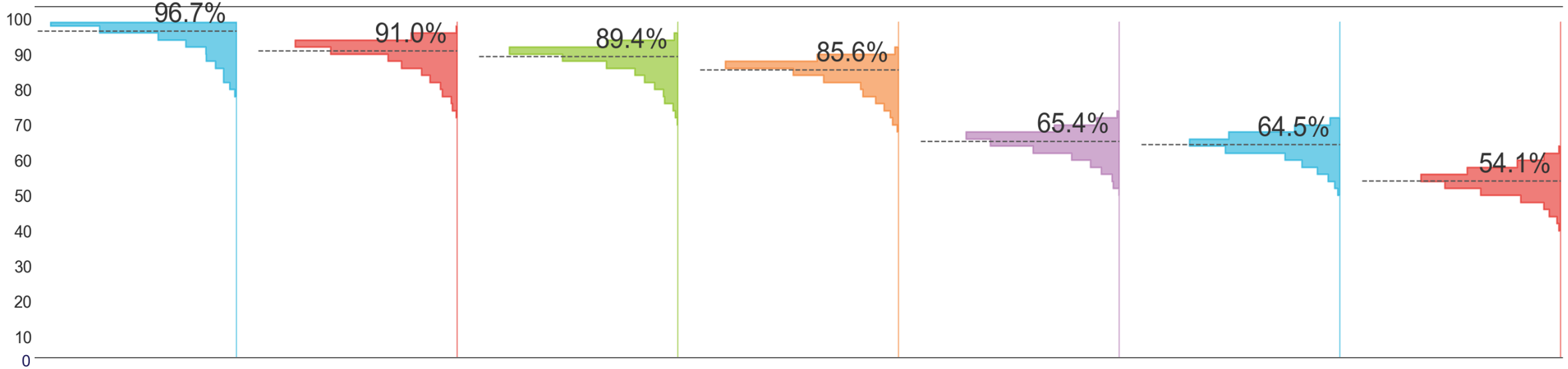
High asset resilience

Remaining wastewater companies excluded due to absence of data

Low asset resilience

Anglian | **Severn Trent** | **Southern** | **Wessex** | **Yorkshire** | **South West** | **Thames**

Vallorii asset resilience index, (normalized)



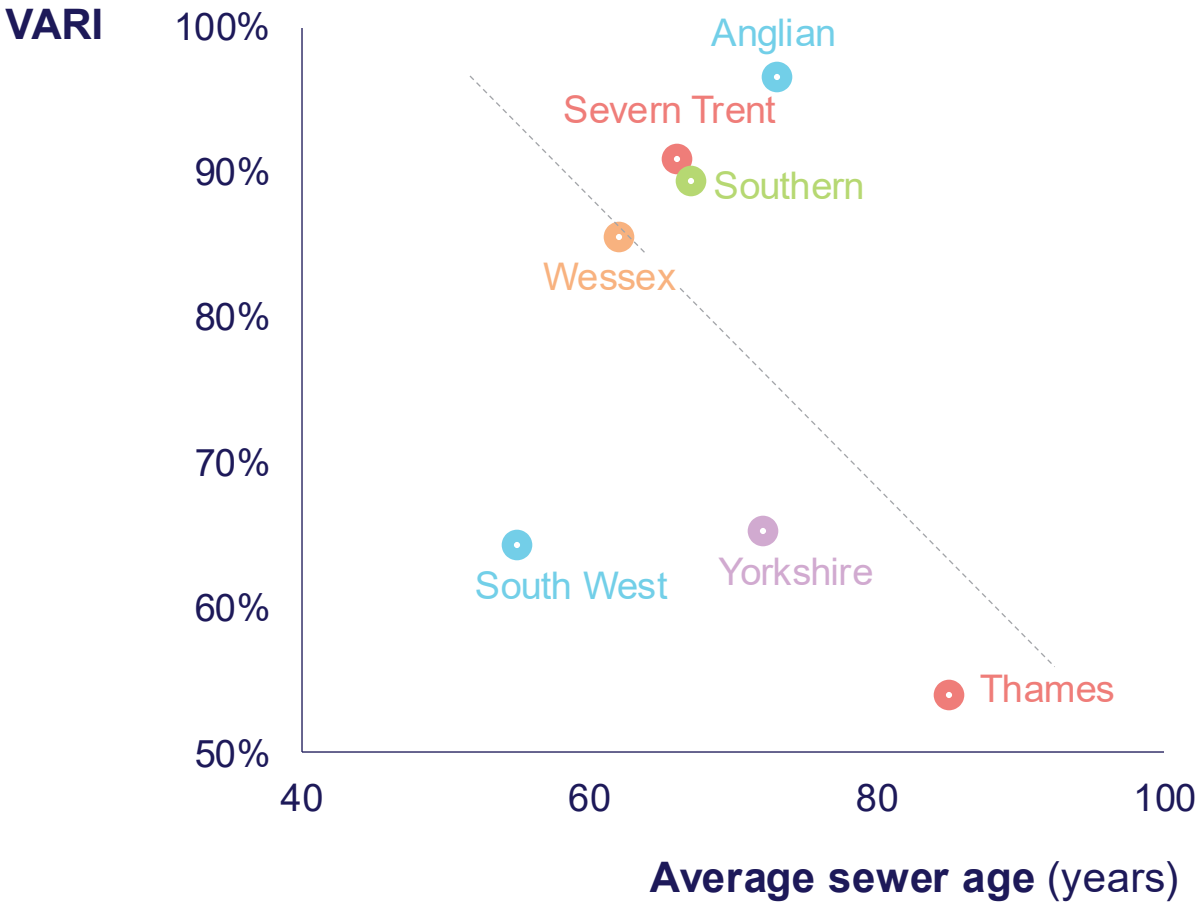
100: High asset resilience. Assets are insensitive to environmental stress.
0: Low asset resilience. Assets are highly sensitive and fail quickly under environmental stress.

Source: Vallorii analysis, Asset resilience estimated using a Bayesian model. Regressors include locational rainfall, groundwater, temperature, and population data, used to estimate observed outcomes in storm overflows. Groundwater data from https://environment.data.gov.uk/hydrology, rainfall and temperature data from https://meteostat.net/, storm overflows data from each water company's disclosures in 2024. Storm overflow location coordinates gathered from Stream UK

There are different sources of resilience. TW low resilience may be driven by its assets' age; SW displays low resilience despite relatively young assets.

Wastewater case example

Preliminary numbers, for discussion



Vallorii asset resilience index

The asset resilience index reflects sensitivity to environmental stress.

Average sewer age

Older sewer systems are more likely to have poor asset resilience and outdated technological solutions.

Source: Vallorii asset resilience index, Ofwat documents,
sewer age from: https://www.unitedutilities.com/globalassets/z_corporate-site/pr19/third-party/t6001_exogenous_drivers_of_wholesale_wastewater_costs.pdf

POLL #1: What is the key driver of asset resilience in infrastructure? (water, energy, transport, telecoms)

Additional **funding**
Better-funded companies have more resilient assets

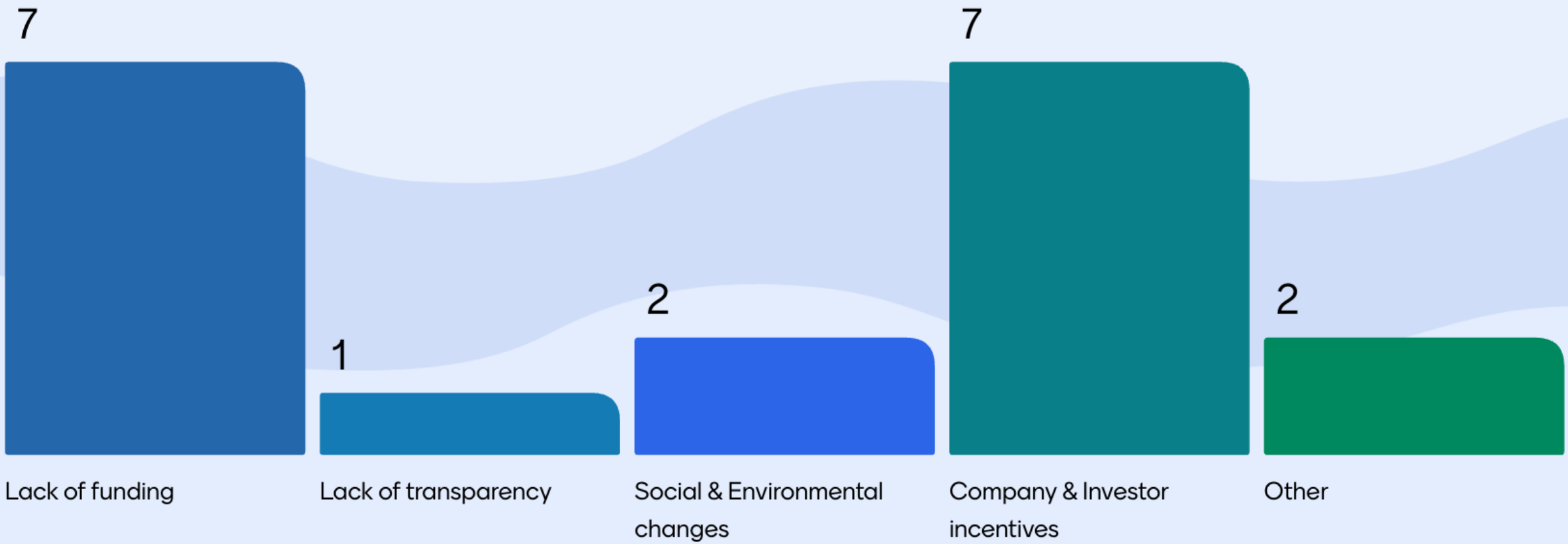
Additional **transparency**
More transparent performance drives asset resilience

Social & Environmental changes
Changing social and environmental landscape decreases relative resilience

Company & Investor **incentives**
Clear incentives drive improvements in asset resilience

Other

What is the key driver of asset risk in infrastructure? (water, energy, transport, telecoms)



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1 AI

How can we use AI to measure asset resilience?

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- Asset resilience directly impacts valuations and the cost of equity
- ***Case study***: VAPRI estimates equity valuation impacts ranging from 15% premium (Anglian) to 53% discount (Thames), based on VARI scores and the CMA's October 2025 5.9% real CoE target

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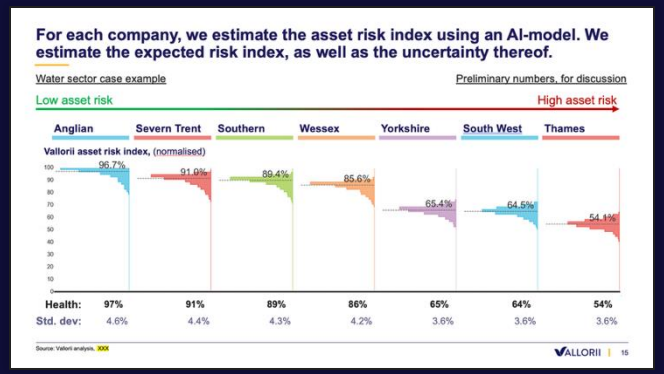
How to increase consumer trust and fund asset resilience improvements?

- Monitoring and asset health metrics (e.g., Ofgem NARM) can improve trust with transparency
- Could the supervisory model (Cunliffe report) drive long-term improvements in the water sector?

We apply VAPRI to estimate the impact of the asset resilience index VARI on cash flows to equity and valuations.

Vallorii asset resilience



Asset resilience index VARI captures the risk of asset failure under different environmental conditions.

Impacts on cash flow to equity (Dividends + terminal value)

Asset resilience impacts performance penalties and operating expenditures

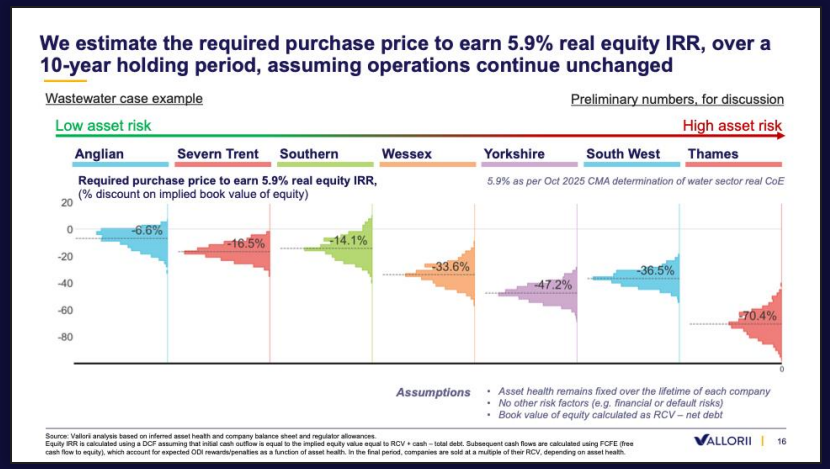
Performance penalties are calibrated to observed company financials.

Low asset resilience reduces equity value at exit

Exit multiples are calibrated to Market-to-Asset ratios.

Longer holding periods are less impacted due to discounting.

DCF quantifies IRR and valuation impacts

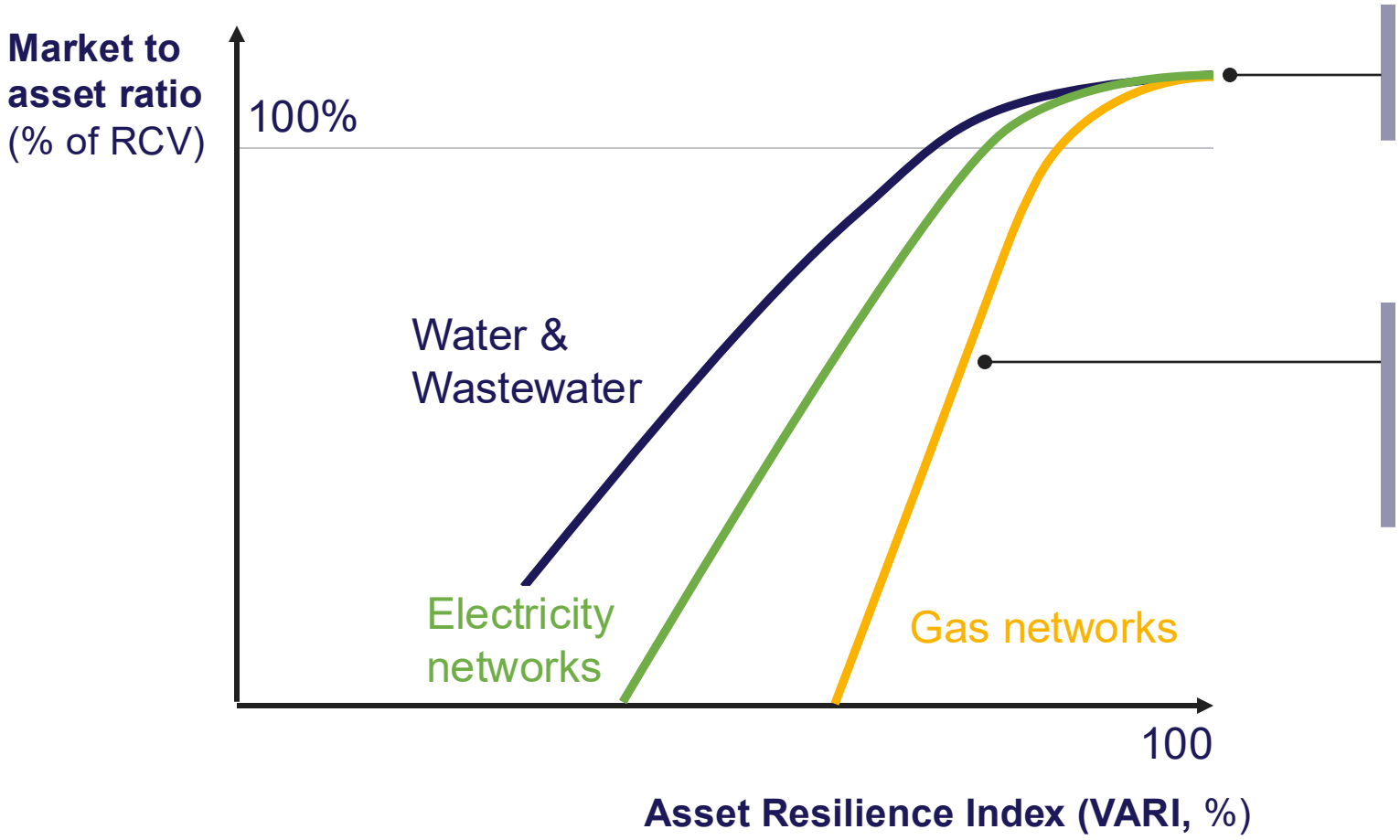


IRR for equity holders given the companies' balance sheet, asset resilience, and cash flow impacts

Source: Vallorii analysis; water companies' 2025 market cap, debt, and RCV values, pulled from Ofwat data and company annual reports

Valuation implications of asset resilience depend on the sector. Gas is sensitive to asset resilience due to health and safety implications.

Illustrative



MAR is capped at 110%
Excess asset resilience is not compensated (avoiding gold-plating).

Value depreciation is accelerated for gas networks compared to water assets. Health and safety liabilities mean that asset underperformance can be detrimental.

We estimate the required purchase price to earn 5.9% (as per CMA) real equity IRR over a 10-year holding period

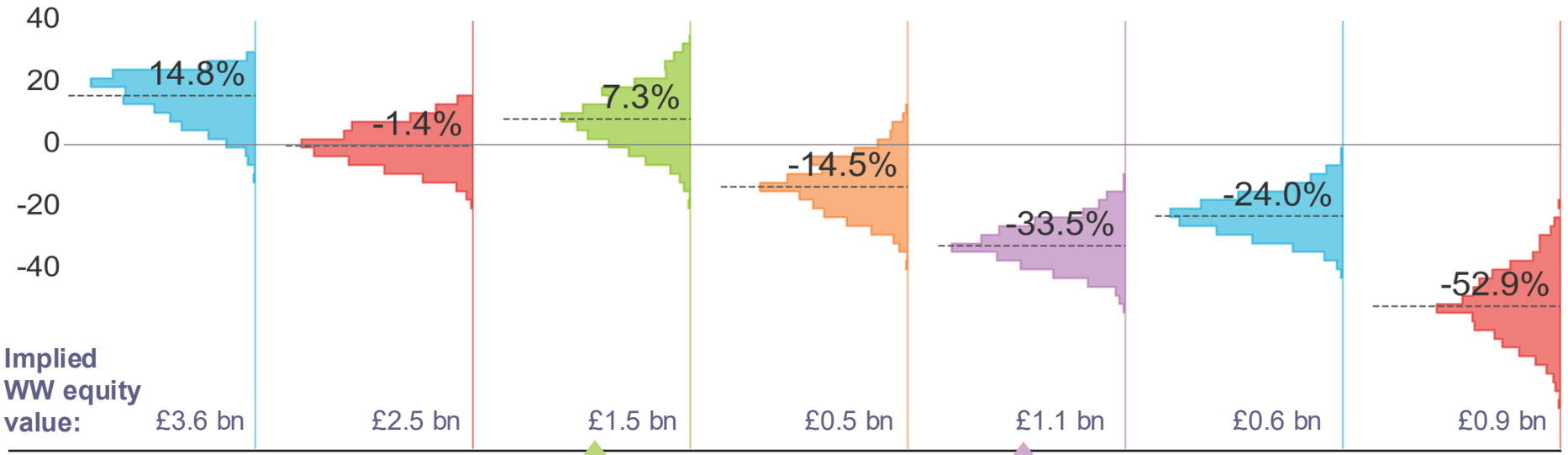
Wastewater case example

Preliminary numbers, for discussion

High asset resilience — Low asset resilience

Anglian | Severn Trent | Southern | Wessex | Yorkshire | South West | Thames

Required purchase price to earn 5.9% real equity IRR (CMA October 2025),
(% discount on implied book value of equity)



Southern's high gearing magnifies positive equity returns

Yorkshire's high gearing magnifies negative equity depreciation

Assumptions

- Fixed purchase price to RCV. Book value of equity calculated as RCV – net debt
- Asset resilience fixed over 10-year holding period
- No other risk factors (e.g. financial or default risks)
- 3% Cost of Debt
- *5.9% target as per Oct 2025 CMA determination of water sector CoE*

Remaining wastewater companies excluded due to absence of data

Source: Vallorii analysis based on inferred asset resilience and company balance sheet and regulator allowances. Initial purchasing costs cash outflow is equal to the implied equity value equal to RCV + cash – total debt. Subsequent cash flows are calculated using FCFE (free cash flow to equity), which account for expected ODI rewards/penalties as a function of asset resilience. In the final period, companies are sold at a multiple of their RCV, depending on asset resilience.

Wessex case example: Strong asset resilience closes gap from 38.5% to 14.5% discount on equity RCV value

Wastewater case example

Preliminary numbers, for discussion

Wessex

Baseline

38.5% baseline RCV discount due to 3.5% 2024/25 real equity returns compared to 5.9% return benchmark.

+ODI impacts

Given Wessex's strong asset resilience, expected ODI rewards increase valuation in the future.

+Terminal value impacts

High asset resilience implies Wessex will be sold at 4% premium to its RCV in 2035 (10-year holding period)

+Other risks

- *Bond market volatility*
- *Capital projects*
- *Illiquidity*
- *…*

Required purchase price to earn 5.9% real equity IRR (CMA October 2025),
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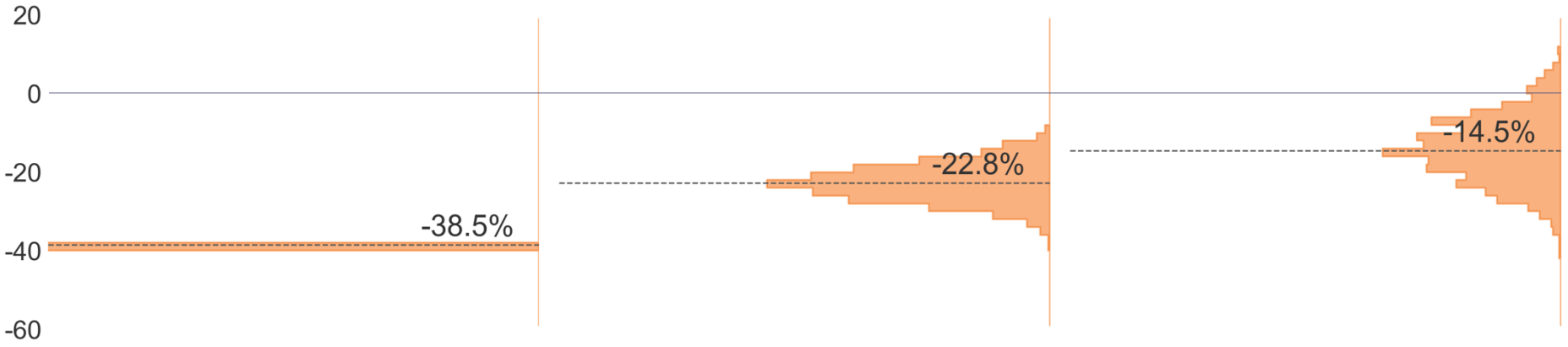

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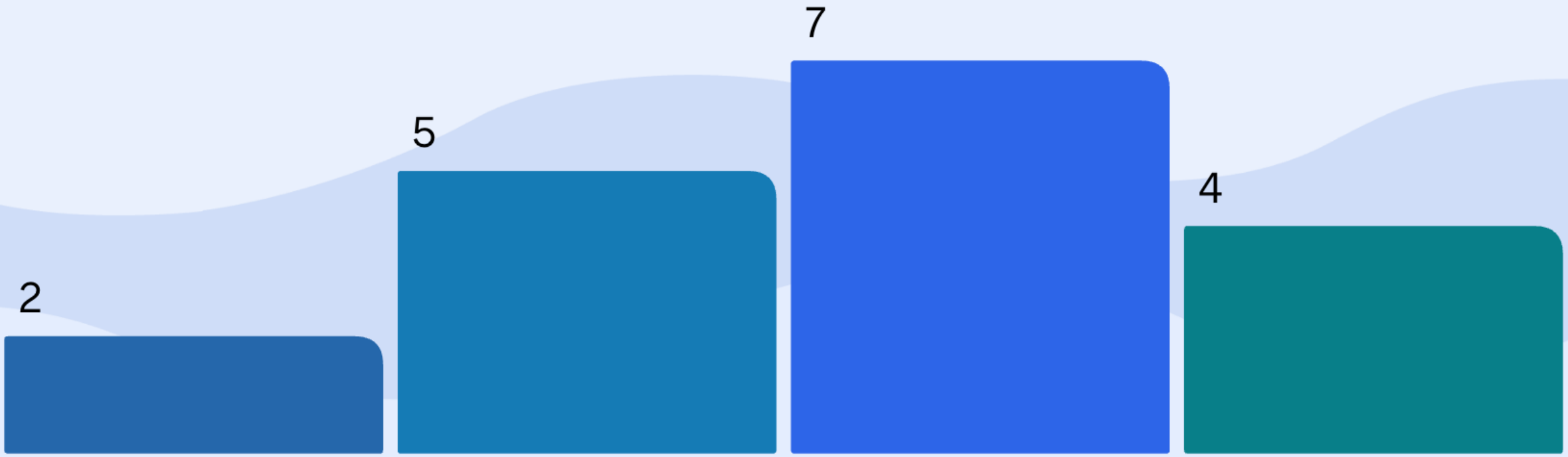
Equity IRR is calculated using a DCF assuming that initial cash outflow is equal to the implied equity value equal to RCV + cash – total debt. Subsequent cash flows are calculated using FCFE (free cash flow to equity), which account for expected ODI rewards/penalties as a function of asset resilience. In the final period, companies are sold at a multiple of their RCV, depending on asset resilience.

POLL #2: Do market valuations adequately reward companies with strong asset resilience in infrastructure? (water, wastewater, energy, transport)

- **Yes –** investors appropriately price asset resilience
- **Sometimes –** it depends on the sector
- **No –** investors cannot rigorously assess resilience due to lack of transparency
- **No –** investors and companies are not incentivized enough to care about asset resilience

Do market valuations adequately reward companies with strong asset resilience in infrastructure? (water, wastewater, energy, transport)



VAPRI determines the fair risk-adjusted CoE. Investors are compensated for return uncertainty, measured as the width of IRR distributions.

Illustrative

Quantify distribution of equity IRR over millions of simulations

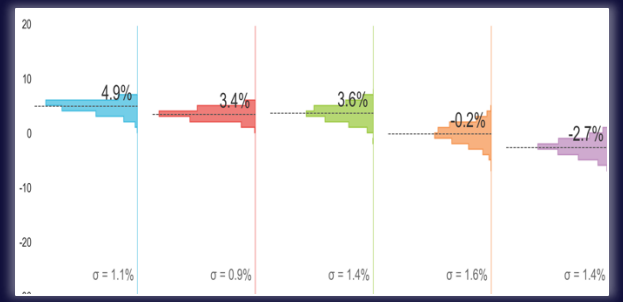
Wessex case example

Distribution of equity (IRR) returns based on underlying uncertainty

The investor **risk** is given by the **width** of the distribution.

*The cost of equity prices the **uncertainty** about future returns*

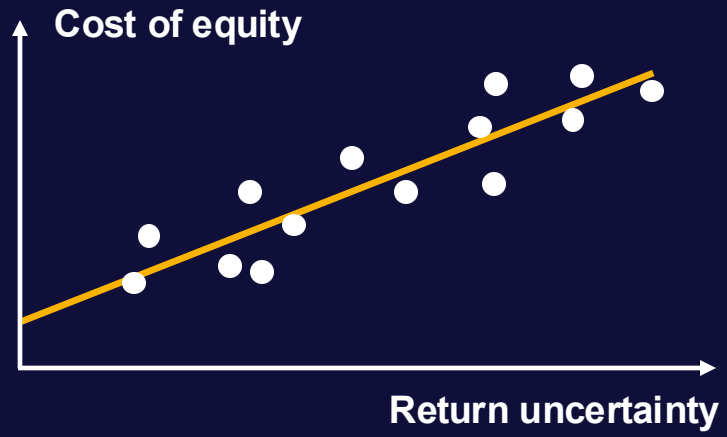
Benchmark IRR distributions



We **benchmark** investor risks across infrastructure assets.

Investments with higher uncertainty achieve higher expected returns.

Cost of equity is proportional to uncertainty in equity returns



The cost of equity is the **representative trade-off** between return uncertainty and expected return.

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- Could the supervisory model (Cunliffe report) drive long-term improvements in the water sector?

There are multiple ways to improve asset resilience. Ofwat working group is currently developing a new asset risk assessment in the water sector.

1 More sticks & carrots (e.g., ODIs)

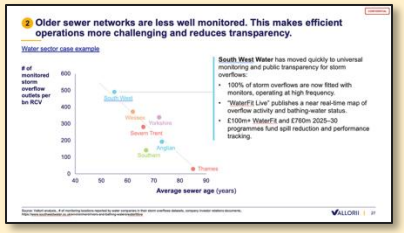
Operational performance metrics incentivise better performance of assets for **equity investors**.

More recently, ODIs have also been coupled with **executive compensation**.

ofgem
Ofwat
Civil Aviation Authority

Details next

2 Increase transparency

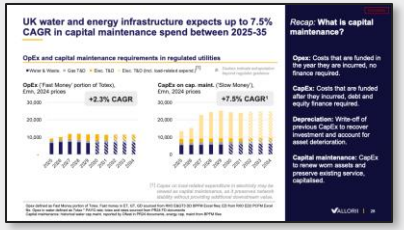


Increased transparency around asset health and resilience drives improvements and enables **targeted funding**.

Environment Agency
ofgem NARM
Stream.®

Focus on January RT -- Affordability

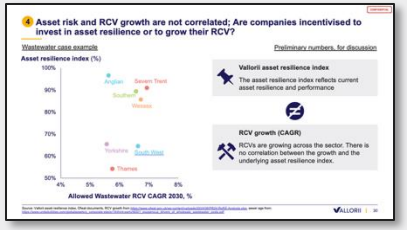
3 Increase expenditure allowances



Expenditure allowances unlock investments in asset resilience. The right **financial vehicle** (e.g., PAYG rates, RCV, Escrow accounts) balance bill impacts with financing requirements.

Ofwat
LONDON ST.PANCRAS HIGHSPEED

4 Reform regulatory accounting



Regulatory accounts that reflect the state of the assets reduces incentives for **financial engineering**.

IPART Independent Pricing and Regulatory Tribunal NSW

Australian regulator sets depreciation allowance based on physical condition of asset

Source: IPART https://regulationbodyofknowledge.org/wp-content/uploads/2013/03/IPART_Rolling_forward_the.pdf

POLL #3: What is the most effective way to incentivise water / energy / transport companies to invest in their asset resilience?

More sticks & carrots
(i.e. ODI rewards and penalties)

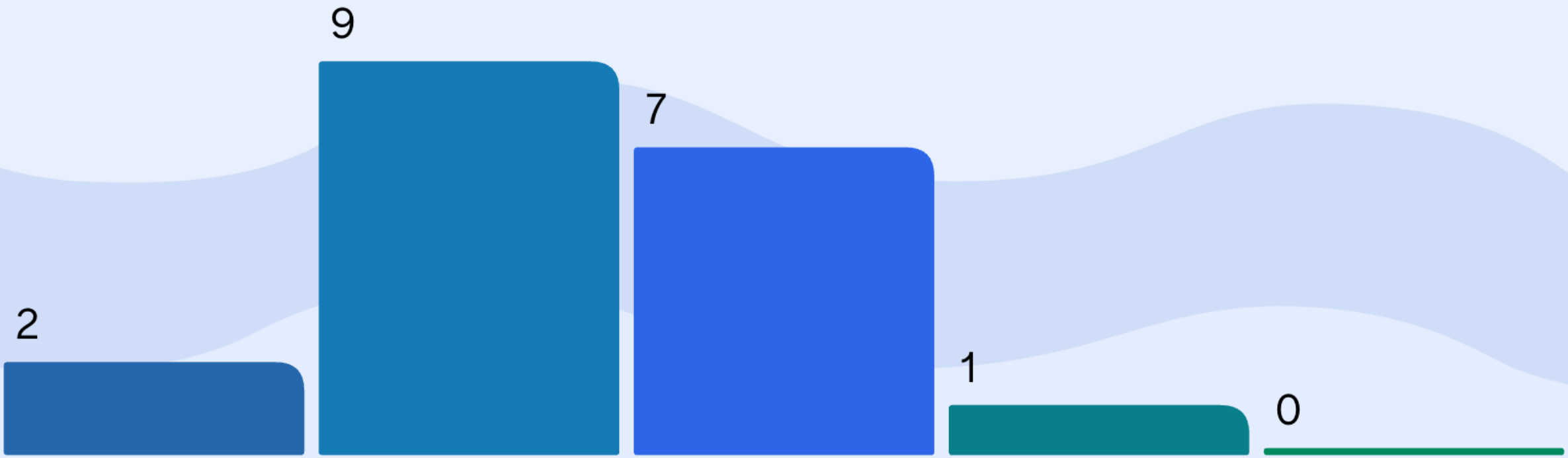
Increase asset risk transparency
(e.g., monitoring, NARM, Vallorii risk index)

Additional expenditure allowances

Reform **regulatory accounting**
(e.g., RCV to reflect asset resilience)

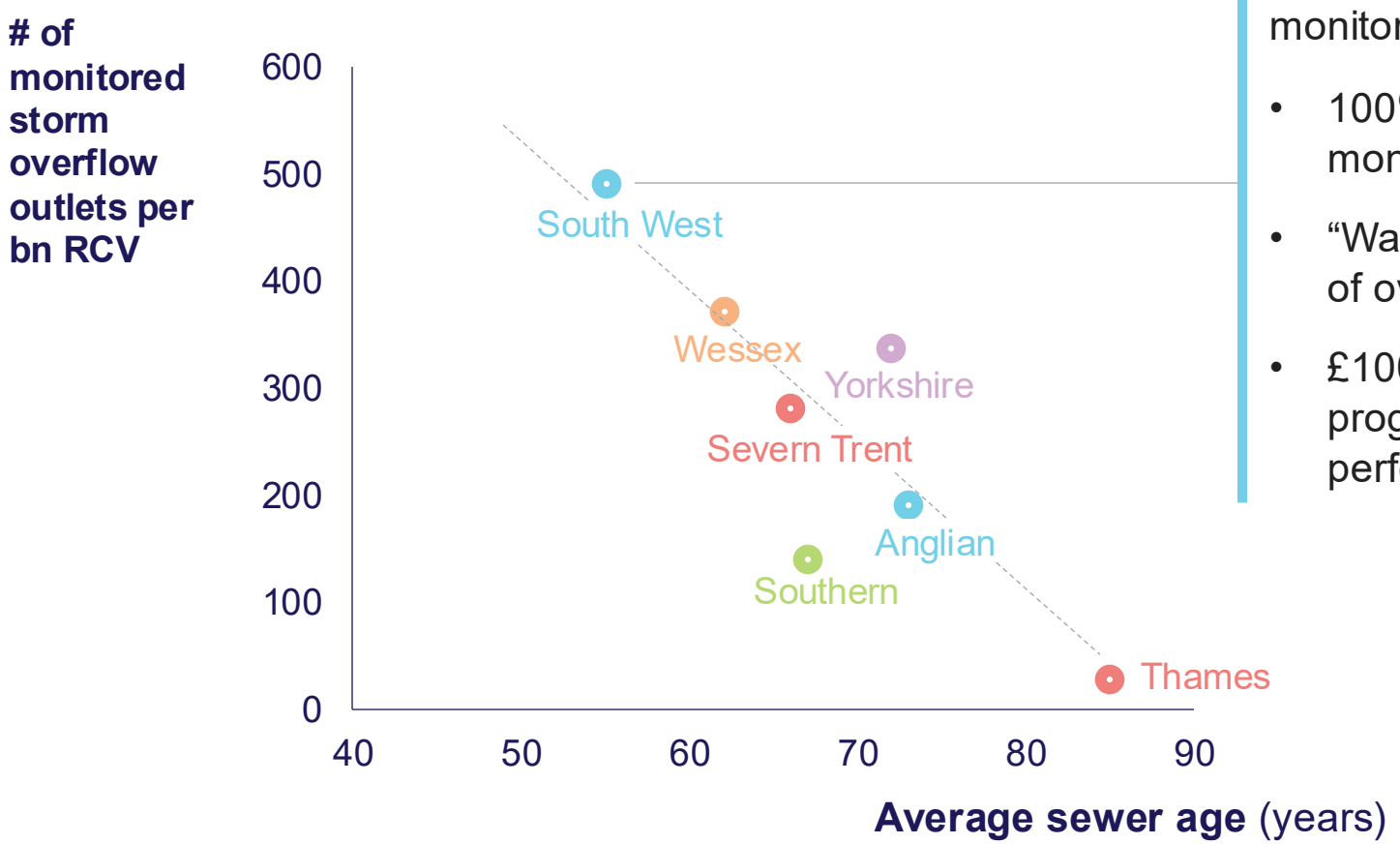
The **current system is working well**

What is the most effective way to incentivise water / energy / transport companies to invest in their asset resilience?



2 Older sewer networks are less well monitored. This makes efficient operations more challenging and reduces transparency.

Wastewater case example



South West Water moved quickly to universal monitoring and public transparency :

- 100% of storm overflows are now fitted with monitors.
- “WaterFit Live” publishes a near real-time map of overflow activity and bathing-water status.
- £100m+ WaterFit and £760m 2025–30 programmes fund spill reduction and performance tracking.

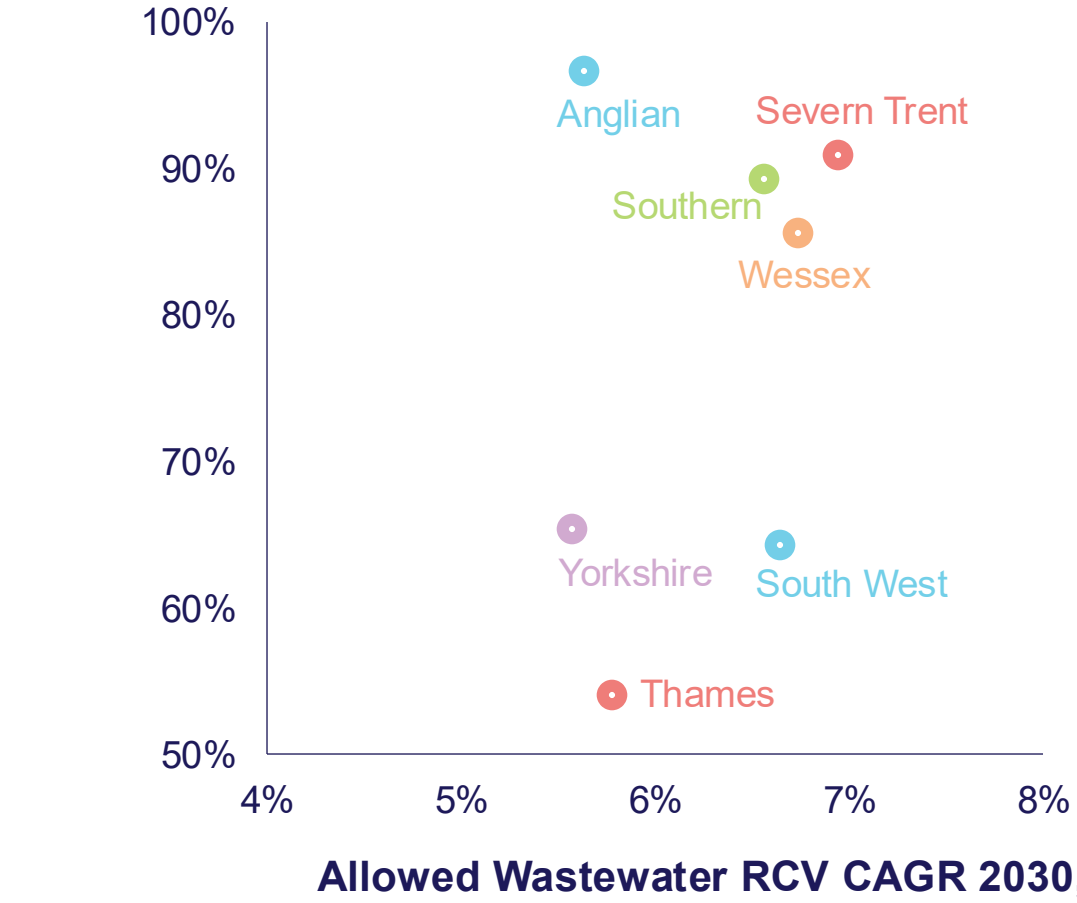
Source: Vallorii analysis, # of monitoring locations reported by water companies in their storm overflows datasets, company investor relations documents, https://www.southwestwater.co.uk/environment/rivers-and-bathing-waters/waterfitlive

2 Asset resilience and RCV growth are not correlated; Are companies incentivised to invest in asset resilience or to grow their RCV?

Wastewater case example

Preliminary numbers, for discussion

Vallorii asset resilience index (%)



Vallorii asset resilience index

The asset resilience index reflects sensitivity to environmental stress.

≠

RCV growth (CAGR)

RCVs are growing across the sector. There is no correlation between the growth and the underlying asset resilience index.

Source: Vallorii asset resilience index, Ofwat documents, RCV growth from https://www.ofwat.gov.uk/wp-content/uploads/2024/08/PR24-RoRE-Analysis.xlsx, sewer age from: https://www.unitedutilities.com/globalassets/z_corporate-site/pr19/third-party/t6001_exogenous_drivers_of_wholesale_wastewater_costs.pdf

Our outlook for 2026:
We build the VAPRI risk catalogue and discuss immediate impacts

Preliminary

January

Affordability

How to balance infrastructure investments with affordability envelopes?

March

Depreciation

What does it mean to depreciate infrastructure assets?

May

Financial resilience

How do we ensure financially resilient infrastructure assets?

July

Geopolitics

What impact does geopolitics have on infrastructure and the Cost of Equity?

September

Vallorii Leaders Forum

Invitation-only gathering of 50 senior leaders to explore how we can deliver infrastructure

September

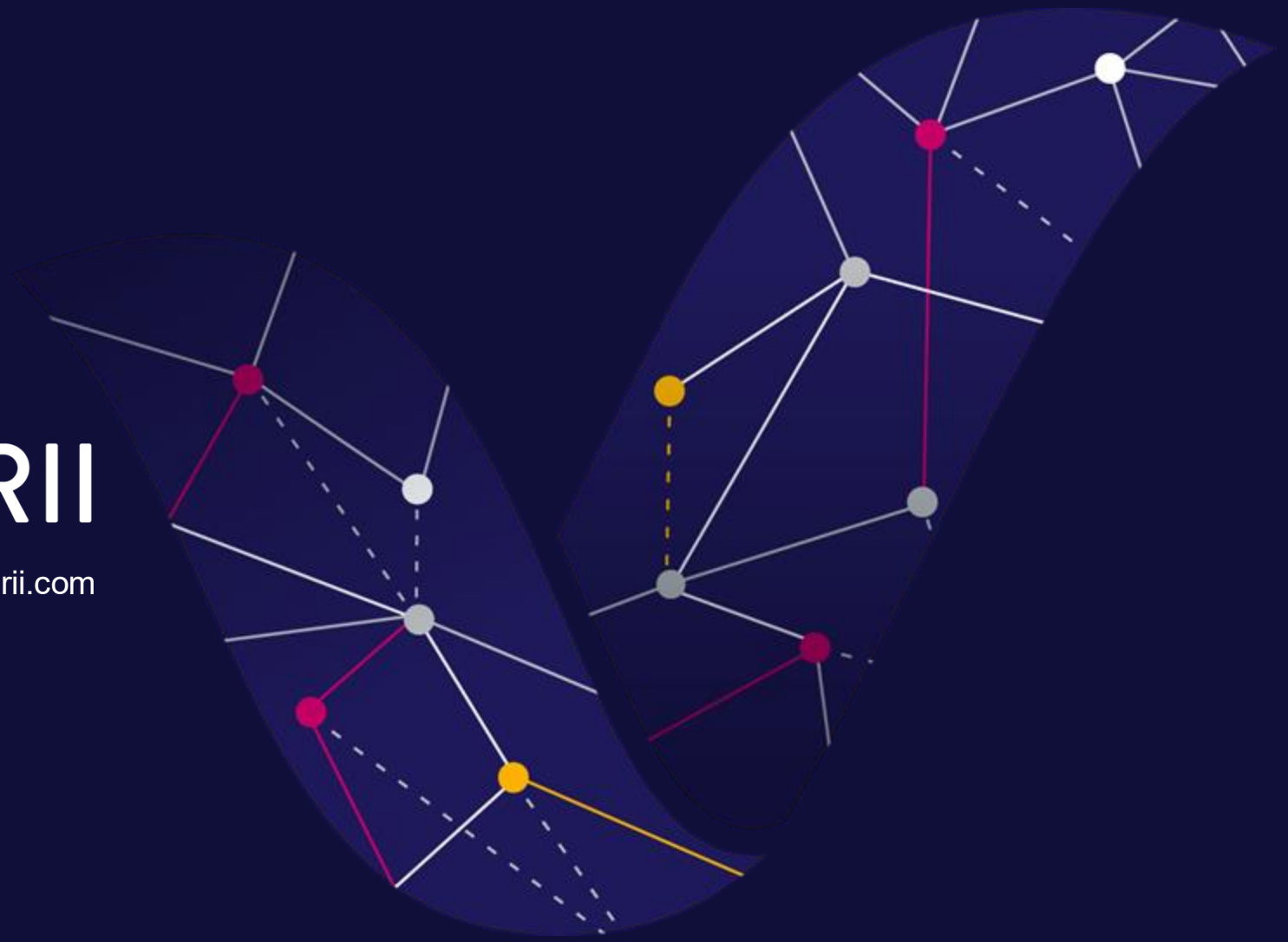
Liquidity

What is liquidity and how does it impact the Cost of Equity?

November

Stock markets

What does the stock (& public fund) market tell us about the CoE?



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